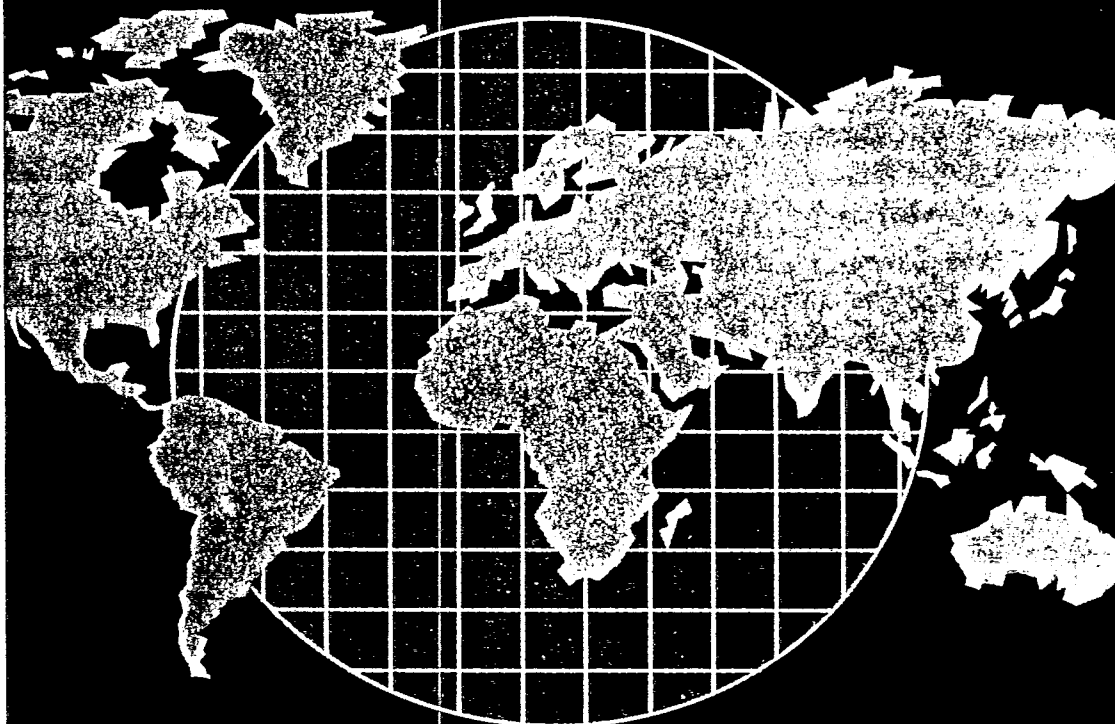


31 MARS 1993  
C3

# TOXIC AND CARCINOGENIC EFFECTS OF SOLID PARTICLES IN THE RESPIRATORY TRACT

4th International Inhalation Symposium, Hannover



1 March - 5 March 1993

Hannover Medical School  
Hannover, Federal Republic of Germany

Sponsored by  
International Life Sciences Institute  
Hannover Medical School  
Fraunhofer Institute of Toxicology and Aerosol Research

1 APR 7 1993

R. A. PAGES

2057358090

## CONTENTS

	Page
About the Symposium . . . . .	5
Committees . . . . .	5
About the Sponsors	
The International Life Sciences Institute. . . . .	6
Hannover Medical School . . . . .	6
Fraunhofer Institute of Toxicology and Aerosol Research . . . . .	7
Addresses . . . . .	7
Acknowledgement of Financial Support . . . . .	7
Presentation of the Kenneth Morgareidge Award . . . . .	8
General Information . . . . .	8
Faculty . . . . .	10
The Symposium at a Glance . . . . .	13
Programme . . . . .	14
Poster Sessions . . . . .	27
Plan of the Medical School . . . . .	32
Room Plans . . . . .	34
Abstracts . . . . .	37
List of Participants . . . . .	135

## CONTENTS

	Page
About the Symposium . . . . .	5
Committees . . . . .	5
About the Sponsors	
The International Life Sciences Institute. . . . .	6
Hannover Medical School . . . . .	6
Fraunhofer Institute of Toxicology and Aerosol Research . . . . .	7
Addresses . . . . .	7
Acknowledgement of Financial Support . . . . .	7
Presentation of the Kenneth Morgareidge Award . . . . .	8
General Information . . . . .	8
Faculty . . . . .	10
The Symposium at a Glance . . . . .	13
Programme . . . . .	14
Poster Sessions . . . . .	27
Plan of the Medical School . . . . .	32
Room Plans . . . . .	34
Abstracts . . . . .	37
List of Participants . . . . .	135

## ABOUT THE SYMPOSIUM

Particles with very low solubility such as quartz, carbon black, diesel soot, charcoal (activated), titanium dioxide, and magnetite have been found to be carcinogenic in the lungs of rats. The significance of these results relative to human risk assessment is uncertain. The phenomenon of "dust overloading of lungs" contributes to the findings, but there also might be a nonthreshold mechanism for carcinogenicity associated with the small size and surface properties of the particles. The potential environmental and occupational consequences are considerable, since exposure to mixed dusts like quartz-containing dusts or soot particles from diesel engines and other incomplete combustion processes is quite common.

There is experimental evidence that a variety of chemically different fibres that are sufficiently long, thin, and durable can induce tumours. The mechanism of fibre carcinogenesis appears to differ substantially from that caused by nonfibrous small particles. The important question of the risks presented to human health by different fibre types will be addressed at the meeting.

The symposium is designed to aid the interpretation of animal and in vitro studies with the above-mentioned substances. The understanding of mechanisms, the improvement of future study designs, and the extrapolation of experimental data to humans are major topics of the meeting.

### INTERNATIONAL ADVISORY COMMITTEE

**Donald L. Dungworth**  
University of California, USA

**Joe L. Mauderly**  
Inhalation Toxicology Research Institute  
Albuquerque, USA

**Ulrich Mohr**  
Hannover Medical School, FRG

**Günter Oberdörster**  
University of Rochester, USA

### SCIENTIFIC PLANNING COMMITTEE

**Uwe Heinrich**  
Fraunhofer Institute of Toxicology and  
Aerosol Research, Hannover, FRG

**Hartwig Muhle**  
Fraunhofer Institute of Toxicology and  
Aerosol Research, Hannover, FRG

**Friedrich Pott**  
Heinrich Heine University  
Düsseldorf, FRG

**Margrit Riebe-Imre**  
Hannover Medical School, FRG

2057358093



## ABOUT THE SPONSORS

### THE INTERNATIONAL LIFE SCIENCES INSTITUTE

The International Life Sciences Institute (ILSI) was established in 1978 as a scientific, nonprofit foundation to promote cooperation among government, industry and the academic world and to further the understanding and resolution of health, nutrition and safety assessment issues. Through ILSI, scientific experts from the academic, public and industrial sectors collaborate on research and education programmes at national and international levels.

ILSI sponsors research, publishes monographs and organizes workshops and symposia that relate to this broad spectrum of issues. Organizations which have collaborated with ILSI in these activities include government agencies, university departments and professional societies. ILSI is affiliated with the World Health Organization as a nongovernmental organization and has specialized consultative status with the Food and Agriculture Organization of the United Nations.

Headquartered in Washington, DC, USA, ILSI's membership includes more than 200 food, chemical and pharmaceutical companies and associations in Australia, Europe, Japan, Latin America, North America, Southeast Asia and elsewhere. Scientists from these organizations, as well as several hundred scientists from universities and government agencies, participate in ILSI programmes.

The activities of ILSI are based on the premise that, through cooperative programmes, scientists from industry, government and universities can have a positive impact on public health and the public's awareness of the factors that affect its health.

### HANNOVER MEDICAL SCHOOL

The Hannover Medical School (MHH) encompasses all disciplines of a modern medical educational establishment. It combines science and research with extensive care for in-patients and out-patients in both medicine and dentistry. The MHH consists of central divisions, service units and central institutions which co-operate closely with one another. A high technical standard is maintained in all these facilities.

Some of the MHH's particular fields of involvement are heart surgery in infants, children and adults, clinical cardiology including cardiac catheter laboratory; child cancer therapy; liver and kidney transplantation, child and adult dialysis including a training centre for home dialysis; high standards in dental surgery and care; accident surgery plus emergency helicopter and ambulance service; nuclear medicine with own reactor and cyclotron; biometry and medical informatics; biomedical and hospital technology.

The MHH employs a staff of around 4,500, of whom 700 are medical doctors and 1,300 directly involved in patient care. With 2080 beds at their disposal, the MHH and its associated hospitals treat over 37,000 in-patients annually. In addition, over 115,000 patients are treated each year in out-patient clinics. The hospital has a student population of 3,500, including 400 dental students. The MHH is active in various research fields and to conduct its research work depends heavily on financial support from public and private sources.

## FRAUNHOFER INSTITUTE OF TOXICOLOGY AND AEROSOL RESEARCH

The Fraunhofer Institute of Toxicology and Aerosol Research is one of 35 separate research institutes forming The Fraunhofer Society for the Advancement of Applied Research, an umbrella organization with its main headquarters based in Munich.

The research topics at the Fraunhofer Institute of Toxicology and Aerosol Research in Hannover relate to all fields of natural and biomedical sciences that may be of importance for promoting human health protection or environmental conservation and improvement. In the end, contract research and intramural projects selected under these aspects are targeted to contribute to the protection of the general well-being of man and his environment under the impact of our modern technologically oriented and industrialized society. Local analyses and status inventories designed to preserve and, where necessary, to improve environmental quality are the first steps in that direction. They serve to make sure that neither the environment will suddenly produce human health hazards nor the quality of the environment itself deteriorate. For this purpose, the Fraunhofer Institute of Toxicology and Aerosol Research co-operates with industrial companies and public authorities in detecting, monitoring and reducing sources of harmful emissions, particularly in the air pollution field, in tracing health risks of old and new chemical substances and in developing processes, products and test procedures compatible with and relevant to the environment.

The interdisciplinary structure of the institute facilitates a diversified teamwork approach in research areas where aspects of medicine, biology, chemistry and physics overlap. With these objectives and an adequate staff structure, the institute represents a place of experimental contract research suitable for dialogues between industry and government including supranational and international organizations.

### ADDRESSES OF SPONSORING ORGANIZATIONS

Ms. Sharon Weiss  
International Life Sciences Institute  
1126 Sixteenth Street, NW, Suite 100  
Washington, DC 20036, U.S.A  
Tel: (202) 659-0074

Prof. Dr. med. Ulrich Mohr  
Hannover Medical School  
Institute for Experimental Pathology  
Konstanty-Gutschow-Str. 8  
3000 Hannover 61, FRG  
Tel: (0511) 532-4520

Prof. Dr. med. Ulrich Mohr  
Fraunhofer Institute of Toxicology and Aerosol Research  
Nikolai-Fuchs Str. 1  
3000 Hannover 61, FRG  
Tel: (0511) 5350-121

### ACKNOWLEDGEMENT OF FINANCIAL SUPPORT

The organizers wish to thank all those who have given this symposium their generous financial support.



## PRESENTATION OF THE KENNETH MORGAREIDGE AWARD

To acknowledge and promote excellence in the broad area of toxicology, the International Life Sciences Institute sponsors the Kenneth Morgareidge Award. Through his dedication, Kenneth Morgareidge inspired many young toxicologists and helped advance the field of chemical safety evaluation. In 1993, this \$ 5,000 award, which will be presented at the symposium, will specifically recognize a scientist who has made outstanding research contributions in the area of inhalation toxicology.

## GENERAL INFORMATION

### LOCATION AND MEETING PLACE

All lectures and poster sessions will be held at the Hannover Medical School. Registration and meeting place will be in Building I6 (Theoretical Institutes II, see p. 32). The Plenary Sessions will be held in Lecture Hall R (see p. 34). On Tuesday and Wednesday afternoon, Paper Sessions will be held parallel in Lecture Halls R and S. Posters (see p. 27) will be presented in the vestibule.

### ASSISTANCE

If you need assistance or information on any matter, please contact one of the members of the secretariat.

### SLIDE CHECKING

Presenters of papers are kindly requested to check in their slides either in the morning or during the breaks well before their session begins. The room for checking slides will be signposted. If you should need assistance, please ask one of our projection assistants or contact one of the members of the secretariat.

### POSTERS

Presenters of posters are kindly requested to mount their posters on Monday, 1 March. Each poster will carry a number, which is given in this booklet on p. 27 - 30. Please contact one of the members of the secretariat, if you should need any kind of assistance. The poster exhibition will be held in the vestibule throughout the meeting and the authors are asked to be present with their poster at the respective time of the Poster Sessions on Wednesday and Thursday.

### ABSTRACTS

All lectures and posters presented during the meeting are marked with an A-number following the title of the presentation. This A-number gives the number of the respective abstract, which is to be found in this booklet (p. 37 - 132).

## PROCEEDINGS

The faculty papers resulting from this symposium will be published as a monograph by ILSI Press.

Presenters of papers or posters also wishing to have their work published in the proceedings are reminded to hand in their manuscripts before their departure. We regret that once the symposium is over manuscripts can no longer be accepted for publication.

## MESSAGES

Emergency messages can be telephoned to the congress office on (0511) 532 5100.

## BREAKS AND LUNCH

The registration fee includes all refreshment breaks, including lunch. Lunches are served in the Medical School cafeteria, the Mensa (Building K15, see plan of the Medical School, p. 32).

## SOCIAL EVENING

On Wednesday, 3 March all participants are cordially invited to a buffet supper at the Pannonia Atrium Hotel.

## FACULTY

**Drummond H. Bowden, M.D.**, University of Manitoba, Winnipeg, Manitoba, Canada

**Joseph D. Brain, S.D. in Hyg.**, Harvard School of Public Health, Boston, Massachusetts, USA

**Andrew Churg, M.D., F.R.C.P.C.**, University of British Columbia, Vancouver, British Columbia, Canada

**John M.G. Davis, Ph.D.**, Institute of Occupational Medicine Ltd, Edinburgh, Scotland

**Kevin E. Driscoll, Ph.D.**, The Procter & Gamble Company, Cincinnati, Ohio, USA

**Donald L. Dungworth, B.V.Sc., Ph.D., M.R.C.V.S.**, University of California, Davis, California, USA

**Makito Emura, Prof. Dr. rer. nat.**, Medizinische Hochschule Hannover, Hannover, FRG

**Jacob N. Finkelstein, Ph.D.**, University of Rochester, Rochester, New York, USA

**Uwe Heinrich, Priv. Doz. Dr. rer. biol. hum.**, Fraunhofer-Institut für Toxikologie und Aerosolforschung, Hannover, FRG

**Agnes B. Kane, M.D., Ph.D.**, Brown University, Providence, Rhode Island, USA

**Marvin Kuschner, M.D.**, State University of New York, Stony Brook, New York, USA

**Arthur M. Langer, Ph.D.**, Brooklyn College, Brooklyn, New York, USA

**John F. Lechner, Ph.D.**, Inhalation Toxicology Institute, Albuquerque, New Mexico, USA

**Bruce E. Lehnert, Ph.D.**, Los Alamos National Laboratory, Los Alamos, New Mexico, USA

**Morton Lippmann, Ph.D.**, New York University Medical Center, Tuxedo, New York, USA

**Joe L. Mauderly, D.V.M.**, Inhalation Toxicology Research Institute, Albuquerque, New Mexico, USA

**Roger O. McClellan, D.V.M.**, Chemical Industry Institute of Toxicology, Research Triangle Park, North Carolina, USA

**Robert Mermelstein, Ph.D.**, Xerox Corporation, Webster, New York, USA

**Ulrich Mohr, Prof. Dr. med., Dr. h.c.**, Medizinische Hochschule Hannover, Hannover, FRG

**Paul Morrow, Ph.D.**, University of Rochester, Rochester, New York, USA

**Brooke T. Mossman, M.S., Ph.D.**, University of Vermont, Burlington, Vermont, USA

**Hartwig Muhle, Priv. Doz. Dr. rer. nat.**, Fraunhofer-Institut für Toxikologie und Aerosolforschung, Hannover, FRG

**Paul Nettesheim, M.D.**, National Institute of Environmental Health Sciences, Research Triangle Park, North Carolina, USA

**Günter Oberdörster, D.V.M., Ph.D.**, University of Rochester, Rochester, New York, USA

**Kent E. Pinkerton, Ph.D.**, University of California, Davis, California, USA

**Friedrich Pott, Prof. Dr. med.**, Medizinisches Institut für Umwelthygiene an der Heinrich-Heine-Universität, Düsseldorf, FRG

**Kurt Ulm, Prof. Dr. rer. nat.**, Klinikum rechts der Isar der Technischen Universität München, München, FRG

**Vanessa Vu, Ph.D.**, US Environmental Protection Agency, Washington, DC, USA

**Bernard M. Wagner, M.D.**, New York University Medical Center, New York, New York, USA

**Peter Wardenbach, Dr.**, Bundesanstalt für Arbeitsschutz, Dortmund, FRG

**David B. Warheit, Ph.D.**, E.I. du Pont de Nemours & Co., Inc., Newark, Delaware, USA



## THE SYMPOSIUM AT A GLANCE

Monday 1 March	Tuesday 2 March	Wednesday 3 March	Thursday 4 March	Friday 5 March
8.00 - 9.30 Registration Opening Address	8.00 - 12.30 <b>Particle - Cell Interaction</b>	8.00 - 11.00 <b>Mechanisms of Pulmonary Carcinogenesis and Fibrosis</b>	8.00 - 12.20 <b>Human Exposure and Effects</b>	8.00 - 11.40 <b>Risk Assessment and Conclusions</b>
9.30 - 10.50 <b>Introduction</b>		11.00 - 11.30 <b>Kenneth Morgareidge Award</b>		11.40 - 12.00 Closing Remarks
11.20 - 12.40 <b>Overview of Chronic Animal Studies</b>				12.00 End of Symposium
12.40 - 14.00 <b>Lunch</b>	12.30 - 13.30 <b>Lunch</b>	11.30 - 13.00 <b>Lunch</b>	12.20 - 13.30 <b>Lunch</b>	
14.00 - 17.40 <b>Overview of Chronic Animal Studies (cont.)</b>	13.30 - 14.40 <b>Particle - Cell Interaction (cont.)</b>	13.00 - 14.30 Poster Session 1	13.30 - 15.00 Poster Session 2	
	14.40 - 17.40 Paper Sessions:	14.30 - 18.00 Paper Sessions:	15.00 - 17.10 <b>Special Session - Particles and Tobacco Smoke</b>	
	1. In Vitro Effects of Solid Particles	3. Fibre Effects		
	2. In Vivo Effects of Solid Particles	4. Different Approaches		
		followed by Symposium Dinner		





## PROGRAMME

**Monday, 1 March 1993**

8.00 - 9.10	<b>Registration / Poster Mounting</b>
9.10 - 9.30	<b>Opening Addresses</b> Prof. Dr. med. R. Pabst, Rector Designate, Hannover Medical School Prof. Dr. med., Dr. h.c. U. Mohr, Hannover Medical School
<b>Introduction:</b>	
9.30 - 10.10	<b>Particle and fibre-induced lesions - an overview (A 1)</b> Agnes B. Kane, M.D., Ph.D., Brown University
10.10 - 10.50	<b>Mechanisms and significance of "particle overload" (A 2)</b> Paul E. Morrow, Ph.D., University of Rochester
10.50 - 11.20	<b>Break</b>
<b>Plenary Session I: Overview of Chronic Animal Studies</b> Chairman: Bernard M. Wagner, M.D., New York University Medical Center	
11.20 - 12.00	<b>Toxicokinetics of solid particles in chronic studies: an overview (A 3)</b> Hartwig Muhle, Dr. rer. nat., Fraunhofer-Institut für Toxikologie und Aerosolforschung
12.00 - 12.40	<b>Non-cancer effects of chronic inhalation exposure of animals to solid particles (A 4)</b> Joe L. Mauderly, D.V.M., Inhalation Toxicology Research Institute
12.40 - 14.00	<b>Lunch</b>

14.00 - 14.40	<b>Carcinogenic effects of solid particles (A 5)</b> Uwe Heinrich, Dr. rer. nat., Fraunhofer-Institut für Toxikologie und Aerosolforschung
14.40 - 15.20	<b>Pathologic effects of inhaled particles in rat lungs: associations between inflammatory and neoplastic processes (A 6)</b> Donald L. Dungworth, B.V.Sc., Ph.D., M.R.C.V.S., University of California at Davis
15.20 - 16.00	<b>Animal inhalation studies with fibres (A 7)</b> John M.G. Davis, Ph.D., Institute of Occupational Medicine Ltd
16.00 - 16.30	<b>Break</b>
16.30 - 17.10	<b>Carcinogenicity studies: relevance of unphysiologic routes (A 8)</b> Friedrich Pott, Prof. Dr. med., Medizinisches Institut für Umwelthygiene, Düsseldorf
17.10 - 17.40	<b>Synthesis</b> Bernard M. Wagner, M.D., New York University Medical Center



---

Tuesday, 2 March 1993

---

**Plenary Session II: Particle - Cell Interaction**

Chairman: Joseph D. Brain, S.D. in Hyg., Harvard School of Public Health

- |               |  |
|---------------|--|
| 8.00 - 8.40   | <b>Fate and translocation of fibres (A 9)</b><br>Kent E. Pinkerton, Ph.D., University of California at Davis   |
| 8.40 - 9.20   | <b>Factors controlling the biological potential of inorganic dusts; surface chemistry and character (A 10)</b><br>Arthur M. Langer, Ph.D., Brooklyn College                                  |
| 9.20 - 10.00  | <b>Pulmonary macrophages: phenomena associated with the particle "overload" condition (A 11)</b><br>Bruce E. Lehnert, Ph.D., Los Alamos National Laboratory                                  |
| <hr/>         |  |
| 10.00 - 10.30 | <b>Break</b>   |
| <hr/>         |  |
| 10.30 - 11.10 | <b>Contribution of macrophage-derived cytokines and cytokine networks to particle-induced inflammatory cell recruitment (A 12)</b><br>Kevin E. Driscoll, Ph.D., The Procter & Gamble Company |
| 11.10 - 11.50 | <b>Mechanisms of asbestos-mediated DNA replication and cell proliferation (A 13)</b><br>Brooke T. Mossman, M.S., Ph.D., University of Vermont  |
| 11.50 - 12.30 | <b>Cell - cell interactions and the role of epithelial cells in the pulmonary response to particulate injury (A 14)</b><br>Jacob N. Finkelstein, Ph.D., University of Rochester              |
| <hr/>         |  |
| 12.30 - 13.30 | <b>Lunch</b>   |
| <hr/>         |  |
| 13.30 - 14.10 | <b>In vitro approaches to screening particles for toxicity (A 15)</b><br>Makito Emura, Prof. Dr. rer. nat., Medizinische Hochschule Hannover   |
| 14.10 - 14.40 | <b>Synthesis</b><br>Joseph D. Brain, S.D. in Hyg., Harvard School of Public Health   |
- 

---

**Lecture Hall R:** *Paper Session 1 - In vitro effects of solid particles*  
Chairman: John F. Lechner, Ph.D., Inhalation Toxicology Research Institute

- |               |  |
|---------------|--|
| 14.40 - 15.00 | <b>Effects of fullerenes on alveolar macrophages in vitro (A 16)</b><br>P. Adelmann, T. Baierl, <u>E. Drosselmeyer</u> , C. Politis, G. Polzer, A. Seidel and C. Steinleitner                            |
| 15.00 - 15.20 | <b>In vitro effects of high T<sub>c</sub> superconducting materials and their components on some immunofunctions of macrophages (A 17)</b><br>G. Polzer, T. Baierl, E. Drosselmeyer and <u>A. Seidel</u> |
| <hr/>         |  |
| 15.20 - 15.50 | <b>Break</b>   |
| <hr/>         |  |
| 15.50 - 16.10 | <b>Use of the detection of anaphase/telophase abnormalities to study genotoxicity of solid particles (A 18)</b><br><u>M. Yegles</u> , A. Renier and M.C. Jaurand   |
| 16.10 - 16.30 | <b>In vitro effects of glass microbeads with different iron content on cultured rat pleural mesothelial cells (A 19)</b><br><u>H. Y. Dong</u> , M. Yegles, A. Renier and M.C. Jaurand                    |
| 16.30 - 16.50 | <b>Mechanism studies of silica toxicity and carcinogenesis at the tissue, cellular and molecular levels (A 20)</b><br><u>U. Saffiotti</u> , L.N. Daniel, M.E. Kaighn, Y. Mao and A.O. Williams           |
| 16.50 - 17.20 | <b>General discussion</b>  |
- 



<b>Lecture Hall S:</b>	
<b>Paper Session 2 - In vivo effects of solid particles</b>	
Chairman: Kevin E. Driscoll, Ph.D., The Procter & Gamble Company	
14.40 - 15.00	<b>Flow cytometric quantitation of clearance and macrophage burden of inhaled polystyrene beads in rodents (A 21)</b> <u>P.H. Ayres</u>
15.00 - 15.20	<b>A five year follow-up of TNF-release and serum type III procollagen as biological markers for pneumoconiosis (A 22)</b> <u>P.J.A. Borm</u> , R. Schins, B. Preat and L. Lenaerts
15.20 - 15.50	<b>Break</b>
15.50 - 16.10	<b>One year exposure to diesel engine exhaust causes lung tumors (A 23)</b> <u>Y. Kawabata</u> , T. Udagawa and K. Iwai
16.10 - 16.30	<b>Subchronic inhalation exposure of rats to carbon black and/or irritant gases (A 24)</b> <u>U. Heinrich</u> , O. Creutzenberg, H.-G. Hoymann, L. Peters and C. Dasenbrock
16.30 - 16.50	<b>Long-term inhalation exposure of rats and mice to diesel exhaust (DE), carbon black (CB), and titanium dioxide (TiO<sub>2</sub>) (A 25)</b> <u>U. Heinrich</u> , R. Fuhst, C. Dasenbrock, H. Muhle, W. Koch and U. Mohr
16.50 - 17.10	<b>In vitro and in vivo toxicity of coal fly-ash and Lytag dust (A 26)</b> <u>J.H.E. Arts</u> , A.A.J.J.L. Rutten, A.H. Penninks and H.W. Hoeksema
17.10 - 17.40	<b>General discussion</b>

Wednesday, 3 March 1993

<b>Plenary Session III: Mechanisms of pulmonary carcinogenesis and fibrosis</b>	
Chairman: Paul Nettesheim, M.D., National Institute of Environmental Health Sciences	
8.00 - 8.40	<b>Mechanism of the induction of fibrosis (A 44)</b> Drummond H. Bowden, M.D., University of Manitoba
8.40 - 9.20	<b>Sequence of events in carcinogenesis - multistage carcinogenesis, initiation, promotion, progression, protooncogenes and tumor suppressor genes (A 45)</b> John F. Lechner, Ph.D., Inhalation Toxicology Research Institute
9.20 - 9.50	<b>Break</b>
9.50 - 10.30	<b>Influences of gender, strain, and species differences in pulmonary toxicological assessments of inhaled particles and/or fibers (A 46)</b> David B. Warheit, Ph.D., E. I. du Pont de Nemours & Co., Inc.
10.30 - 11.00	<b>Synthesis</b> Paul Nettesheim, M.D., National Institute of Environmental Health Sciences
11.00 - 11.30	<b>Presentation of the Kenneth Morgareidge Award</b>
11.30 - 13.00	<b>Lunch</b>
13.00 - 14.30	<b>Poster Session 1 - In vitro and in vivo effects of solid particles</b>



<b>Lecture Hall R: <i>Paper Session 3 - Fibre effects</i></b> Chairman: Donald L. Dungworth, B.V.Sc., Ph.D., M.R.C.V.S., University of California at Davis	
14.30 - 14.50	<b>The effect of chemical composition on the solubility of glass fibres in vivo and in vitro (A 47)</b> <u>K.J. Morris</u> , K.A. Launder, S.B. Hornby, A. Morgan, C.G. Collier, J.A. Davis, W.L. Eastes and S.M. Mattson
14.50 - 15.10	<b>Long-term clearance of ceramic fibers from guinea pig lungs (A 48)</b> <u>Y.Y. Hammad</u> and B. Atieh
15.10 - 15.30	<b>Biopersistence of crocidolite vs. manmade vitreous fibers (MMVF) in rat lungs after brief exposures (A 49)</b> <u>R. Musselman</u> , W. Müller, W. Eastes, J. Hadley, O. Kamstrup, P. Thevenaz and T. Hesterberg
15.30 - 15.50	<b>Chronic inhalation toxicity of fibrous glass in rats (A 50)</b> <u>T.W. Hesterberg</u> , W.C. Müller, E.E. McConnell, J.G. Hadley, D.M. Bernstein, P. Thevenaz and R. Anderson
15.50 - 16.10	<b>Chronic inhalation, intratracheal and biopersistence studies on refractory ceramic fibers (RCF) (A 51)</b> R.W. Mast, <u>L.R. Glass</u> , E.E. McConnell, T.W. Hesterberg and R. Anderson
16.10 - 16.30	<b>Break</b>
16.30 - 16.50	<b>A comparison of the effects of chrysotile and crocidolite asbestos in rats after inhalation (A 52)</b> <u>E.E. McConnell</u> , T.W. Hesterberg, J.G. Hadley and R.W. Mast
16.50 - 17.10	<b>Biopersistence and pulmonary effects of inhaled Kevlar® or wollastonite fibers following short-term exposures (A 53)</b> <u>D.B. Warheit</u> , T.A. McHugh, K.A. Kellar and M.A. Hartsky
17.10 - 17.30	<b>Squamous lung lesions associated with the chronic exposure by inhalation of rats to p-aramid fibrils and to titanium dioxide: findings of a pathology workshop (A 54)</b> <u>L.S. Levy</u>
17.30 - 18.00	<b>General discussion</b>

<b>Lecture Hall S: <i>Paper Session 4 - Different approaches</i></b> Chairman: Morton Lippmann, Ph.D., New York University Medical Center	
14.30 - 14.50	<b>Learning from experiences on human BAL, which parameters in experimental inhalation toxicology can be used (A 66)</b> <u>B. Klein</u> , B. Rehn, E. Gono, J. Bruch, H. Teschler, U. Costabel and N. Konietzko
14.50 - 15.10	<b>Molecular toxicology endpoints in rodent inhalation studies (A 67)</b> <u>D.J. Doolittle</u>
15.10 - 15.30	<b>Questions about the risk assessment methods using linear downward extrapolation (A 68)</b> <u>T.D. Sterling</u>
15.30 - 15.50	<b>Use of asbestos, health risks and induced occupational diseases in the former East Germany (A 69)</b> <u>W. Sturm</u> , B. Menze, J. Krause and B. Thriene
15.50 - 16.10	<b>Separation, deposition and lung clearance of fibrous solid particles (Review) (A 70)</b> <u>K.R. Spurny</u>
16.10 - 16.30	<b>Break</b>
16.30 - 16.50	<b>Long term dust exposure in foundry workers may lead to impaired lung function (A 71)</b> <u>W.D. Schneider</u> , H. Karsten and E. Gierke
16.50 - 17.10	<b>Characterization of historical samples of nickel refinery dusts from the Clydach refinery (A 72)</b> M.H. Draper, <u>J.H. Duffus</u> , P. John, L. Metcalfe, L. Morgan, M.V. Park and M.I. Weitzner
17.10 - 17.40	<b>General discussion</b>



### Plenary Session IV: Human exposure and effects

8.00 - 8.40	<b>Human exposure to insoluble isometric particles (A 80)</b> Robert Mermelstein, Ph.D., Xerox Corporation
8.40 - 9.20	<b>Particle deposition and accumulation in human lungs (A 81)</b> Morton Lippmann, Ph.D., New York University Medical Center
9.20 - 10.00	<b>Mineral analysis of human autopsy lungs - comparisons with predictive data (A 82)</b> Andrew Churg, M.D., University of British Columbia

10.30 - 11.10	<b>Lung histopathology after chronic dust exposure</b> Marvin Kuschner, M.D., State University of New York
11.10 - 11.50	<b>Epidemiology after chronic dust exposure (A 83)</b> Kurt Ulm, Prof. Dr. rer. nat., Technische Universität München
11.50 - 12.20	<b>Synthesis</b> Drummond H. Bowden, M.D., University of Manitoba

13.30 - 15.00 **Poster Session 2 - a) Fibre effects**  
**b) Different approaches**  
**c) Particles and tobacco smoke**

**Special Session: Particles and tobacco smoke**

15.00 - 15.20 **Sub-chronic inhalation study in rats, using aged and diluted sidestream smoke from a reference cigarette (A 84)**  
C.R.E. Coggins

15.20 - 15.40 **Comparative inhalation studies in rodents, using smoke from cigarettes that heat rather than burn tobacco, with special reference to particulates (A 85)**  
C.R.E. Coggins

15.40 - 16.00 **Effects of cigarette smoke exposure on rat lung clearance of insoluble particles (A 86)**  
G.L. Finch, B.T. Chen, E.B. Barr and I.-Y. Chang

16.00 - 16.20 **Uptake of respirable suspended particles (RSP) by exposure to environmental tobacco smoke (ETS) (A 87)**  
T. Ruppert, G. Scherer, H. Daube and F. Adlkofer

16.20 - 16.40 **Possible effects on occupational lung cancer from smoking-related changes in the mucus content of the lung (A 88)**  
T.D. Sterling and T.M. Poland

16.40 - 17.10      **General discussion**

---

Friday, 5 March 1993

---

**Plenary Session V: Risk assessment and conclusions**

Chairman: Roger O. McClellan, D.V.M., Chemical Industry  
Institute of Toxicology

- 8.00 - 8.40     **Extrapolation of results from animal inhalation studies to humans? (A 91)**  
Günter Oberdörster, D.V.M, Ph.D., University of Rochester
- 8.40 - 9.20     **Contribution of inhalation bioassays to the assessment of human health risks from solid airborne particles (A 92)**  
Joe L. Mauderly, D.V.M., Inhalation Toxicology Research  
Institute
- 9.20 - 10.00     **Assessment of the potential health effects of natural and man-made fibres and testing needs: perspectives of the U.S. Environmental Protection Agency (A 93)**  
Vanessa T. Vu, Ph.D., US Environmental Protection Agency

---

10.00 - 10.30     **Break**

---

10.30 - 11.10     **Current approaches to regulate hazardous substances including dusts at work (EEC/FRG) (A 94)**  
Peter Wardenbach, Dr., Bundesanstalt für Arbeitsschutz

11.10 - 11.40     **Synthesis and research needs**  
Roger O. McClellan, D.V.M., Chemical Industry Institute of  
Toxicology

---

11.40 - 12.00     **Closing Remarks**

---

End of Symposium

Notes

---

